



# UNITED STATES PATENT AND TRADEMARK OFFICE

*CM*  
UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/679,692

10/07/2003

Benjamin G. Davis

GRT/117-480

7864

23117

7590

12/28/2007

NIXON & VANDERHYE, PC  
901 NORTH GLEBE ROAD, 11TH FLOOR  
ARLINGTON, VA 22203

EXAMINER

CHOWDHURY, IQBAL HOSSAIN

ART UNIT

PAPER NUMBER

1652

MAIL DATE

DELIVERY MODE

12/28/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/679,692	Applicant(s) DAVIS, BENJAMIN G.	
	Examiner Iqbal H. Chowdhury, Ph.D.	Art Unit 1652	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 September 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-23, 27-32 and 38-45 is/are pending in the application.
- 4a) Of the above claim(s) 27-32, 44 and 45 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23, 38-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Application Status***

Claims 1-23 and 27-44 are currently pending in the instant application.

In response to a previous Office action, a non-final action (mailed on May 1, 2007), applicants filed a response and amendment on September 4, 2007, amending claims 1, 5, and 30, canceling claims 24-26 and 33-37, and adding new claims 42-45 is acknowledged.

Claims 1-23, 27-32, and 38-45 are currently pending in the instant application. Claims 27-32 remain withdrawn as they are drawn to non-elected inventions.

New claims 44 and 45 recite the subject matter of Group III of the restriction requirement set forth on 3/15/2006 and thus are also withdrawn as reciting a nonelected invention.

Claims 1-23 and 38-43 are under consideration and will be examined herein.

Applicants' arguments filed on September 4, 2007, have been fully considered and are deemed to be persuasive to overcome some of the rejections previously applied. Rejections and/or objections not reiterated from previous office actions are hereby withdrawn.

***Maintained-Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Previous rejection of Claims 1-23, 38-39, and 41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement is maintained and new claims 42 and 43 re included in this rejection. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1-23 and 41 are directed to a modified polypeptide having any carbohydrate processing enzymatic activity, comprising (a) an amino acid sequence of SEQ ID NO:2 comprising any mutation at least one of W433, E432 and M439; (b) the amino acid sequence of a family 1 glycosyl hydrolase, comprising any mutation at least at an amino acid residue corresponding to at least one of W433, E432 and M439; and (c) a variant of (a)

having any carbohydrate processing enzymatic activity and comprising any mutation in an amino acid residue corresponding to at least one of W433, E432 and M439 of SEQ ID NO:2, wherein said variant has at least 95% identity to SEQ ID NO:2 over the entire length of the sequence of SEQ ID NO:2 (claim 1). Claim 5 recites a modified polypeptide having carbohydrate processing enzymatic activity, said polypeptide comprising an amino acid sequence selected from: (a) the amino acid sequence of SEQ ID NO:2 comprising one or more mutations selected from the group consisting of W433C, E432C and M439C; (b) the amino acid sequence of a family 1 glycosyl hydrolase, comprising at least a mutation in an amino acid residue corresponding to at least one of W433, E432 and M439 of SEQ ID NO:2 wherein the amino acid is substituted by a C (cysteine) residue; and (c) a variant of (a) having carbohydrate processing enzymatic activity and comprising a mutation in an amino acid residue corresponding to at least one of W433, E432 and M439 of SEQ ID NO:2 wherein the amino acid is substituted by a C (cysteine) residue and wherein said variant has at least 30% identity to SEQ ID NO:2 over the entire length of the sequence of SEQ ID NO:2. Claim 18 recites the polypeptide of claim 1, wherein the polypeptide has glycosyl synthase, glycosyl hydrolase, and/or transglycosylase activity.

Claim 41 recites the polypeptide of claim 1, wherein said polypeptide comprising an amino acid sequence selected from: (a) the amino acid sequence of SEQ ID NO:2 comprising a mutation in at least one of W433, E432 and M439; and (b) the amino acid sequence of a family 1 glycosyl hydrolase, comprising a mutation at an amino acid residue corresponding to at least one of W433, E432 and M439 of SEQ ID NO:2; wherein said polypeptide further comprises a mutation of a catalytic nucleophilic residue of the active site.

Applicants argue that in order to further the prosecution of this application the independent claims are amended to require the variants have at least 95% identity to SEQ ID NO: 2 over the entire length of the sequence in (c) and the polypeptide must also have carbohydrate processing enzymatic activity. Applicants also argue that the polypeptides falling within the scope of the claims are therefore well defined by the limitations of the independent claims, which reference both their biological activity and their chemical structure (i.e., the amino acid sequence). Applicants further argue that based on case law and the Patent Office guidelines, the teachings in Applicant's specification shows that he was in possession of the claimed invention.

Applicant's arguments and amendments to claims have been fully considered but are not deemed to be persuasive to overcome the rejection on written description issues. Examiner acknowledges amendment to the claims, however the amendment does not give enough structural feature of any mutation in at least one of W433, E432 and M439 of SEQ ID NO: 2 as well as functional feature, i.e. having any carbohydrate processing activity that in fact is not a specific functional feature, which is required for fulfilling written description requirements. In view of the recitation of **comprising** a mutation in at least one of W433, E432 and M439, claim 1 part (a) and (b) does not have any structural feature at all and specific functional feature, which is very broad. The term **comprising** includes mutation of any number of amino acid residues of SEQ ID NO:2 or the family 1 glycosyl hydrolase in addition to the alteration at the recited the amino acid residue, and results in any structure said modified protein. Therefore, one of skill in the art would not know the specific structure function correlation of the modified polypeptide to practice the claimed invention. Furthermore, the limitation of claim 1 part (c) does not limit the scope of part (a) and (b) of claim 1. As discussed in the written description guidelines the written description requirement for a claimed genus may be satisfied through sufficient description of a representative number of species by actual reduction to practice, reduction to drawings, or by disclosure of relevant, identifying characteristics, i.e., structure or other physical and/or chemical properties, by functional characteristics coupled with a known or disclosed correlation between function and structure, or by a combination of such identifying characteristics, sufficient to show the applicant was in possession of the claimed genus. A representative number of species means that the species, which are adequately described are representative of the entire genus. **Thus, when there is substantial variation within the genus, one must describe a sufficient variety**

**of species to reflect the variation within the genus.** Satisfactory disclosure of a representative number depends on whether one of skill in the art would recognize that the applicant was in possession of the necessary common attributes or features of the elements possessed by the members of the genus in view of species disclosed. For inventions in an unpredictable art, adequate written description of a genus, which embraces widely variant species, cannot be achieved by disclosing only one species within the genus. The specification teaches a single representative species of SEQ ID NO: 2 and few mutant proteins having few mutations. The genus of modified polypeptide of SEQ ID NO: 2 having any mutation at position W433, E432 and M439 is structurally diverse as it broadly encompasses many mutants and variants comprising any carbohydrate processing activity having different structures. As such, the disclosure is neither structural features nor functional features present in all members of the genus is insufficient to be representative of the attributes and features of the entire genus (structure and function).

Claims 38, 42 and 43 are included in this rejection because they lack specific functional feature, since "carbohydrate processing activity" is in fact a recitation of a broad genus of distinct functions and thus the claims encompass a diverse genus of enzymes for which representative species have not been provided, For these claims the rejection can be avoided by reciting the functional feature of beta-glycosidase activity for which the disclosed species are clearly representative. Therefore, the rejection is maintained.



***Maintained - Claim Rejections - 35 U.S.C. § 112***

Previous rejection of Claims 1-23, 38-39 and 41 under 35 U.S.C. 112, first paragraph, enablement requirement, is maintained and new claims 42 and 43 are included in this rejection. This rejection has been described in length in previous Office Action. The rejection is maintained for the following reasons.

Applicants argue that the Patent Office has the initial burden to question the enablement provided for the claimed invention and it is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain why it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning, which is inconsistent with the contested statement, and specific technical reasons are always required. Applicants also argue that the independent claims are amended to require the variants to have at least 95% identity to SEQ ID NO: 2 over the entire length of the sequence in (c), wherein the polypeptide must also have carbohydrate processing enzymatic activity. Applicants finally state that the teachings in Applicant's specification would enable persons skilled in the art to make and use the claimed polypeptides without undue experimentation.

Applicant's arguments have been fully considered but are not deemed persuasive to overcome the rejection of claims on scope of the enablement issues. Amended claims still read on any modified polypeptide comprising any mutation in at least one of W433, E432 and M439 of SEQ ID NO: 2 having any functional feature, (part (a) & (b), i.e. having any carbohydrate processing activity is in fact not a specific functional feature, which is very broad. In view of the recitation of comprising a mutation in at least one of W433, E432 and M439, claim 1 part (a) and (b) does not have any structural feature at all and specific functional feature, which is very broad. The term comprising includes mutation of any number of amino acid residues of SEQ ID NO:2 or the family 1 glycosyl hydrolase in addition to the alteration at the recited the amino acid residue, and results in any structure said modified protein. One of ordinary skill in the art would not practice the claimed invention without knowing the specific structural and functional feature of claimed modified polypeptide, which would require undue experimentation. As mentioned in the previous Office Actions, Claims are so broad as to encompass a modified carbohydrate processing enzyme comprising any mutation at any position of SEQ ID NO: 2, wherein a mutation in at least one of positions W433, EE432 and in M439 are included or an enzyme having family 1 glycosyl hydrolase

activity comprising any mutation at recited positions of SEQ ID NO: 2, wherein a mutation in at least one of positions W433, EE432 and in M439 are included or any variant having 95% identity to SEQ ID NO: 2 over the entire length of the amino acid sequence having any carbohydrate processing activity.

The scope of the claimed invention is substantially broad in the context of 1) any mutation at any recited positions of SEQ ID NO: 2 (part (a) & (b)) having any carbohydrate processing activity; or 2) any mutation at any recited positions of SEQ ID NO: 2 having family 1 glycosyl hydrolase activity, which includes many mutants or variants.

The specification clearly requires that one of ordinary skill in the art know or be provided with guidance for the selection of which of the infinite number of glycosyl hydrolase have the claimed property. Without such guidance one of ordinary skill would be reduced to the necessity of producing and testing all of the virtually infinite possibilities. This would clearly constitute **undue** experimentation. While enablement is not precluded by the necessity for routine screening, if a large amount of screening is required, the specification must provide a reasonable amount of guidance with respect to the direction in which the experimentation should

proceed. Such guidance has **not** been provided in the instant specification. As previously stated the applicants have not provided sufficient guidance to enable one of ordinary skill in the art to make and use the claimed invention in a manner reasonably correlated with the scope of the claims broadly including a modified enzyme of SEQ ID NO: 2 having any mutation at position W433, E432 and M439 of SEQ ID NO: 2 having family glycosyl hydrolase activity because the specification does **not** establish: (A) regions of the protein structure which may be modified without affecting carbohydrate processing activity; (B) the general tolerance of glycosyl hydrolase polypeptide to modification and extent of such tolerance; (C) a rational and predictable scheme for modifying any amino acid residues of with an expectation of obtaining the desired biological function; and (D) the specification provides insufficient guidance as to which of the essentially infinite possible choices is likely to be successful. Therefore, the rejection is maintained.

Claims 38, 42 and 43 are included in this rejection because they lack specific functional feature, since "carbohydrate processing activity" is in fact a recitation of a broad genus of distinct functions not found in the mutant enzymes disclosed in the specification and thus the claims encompass mutating a family 1 glycosyl hydrolase to produce enzymes having different

functions than those present in the unmutated enzyme for which the specification provides absolutely no guidance whatsoever. For these claims the rejection can be avoided by reciting the functional feature of beta-glycosidase activity which the unmutated enzymes inherently possess. Therefore, the rejection is maintained.

### ***Conclusion***

Claims 1-23, 27-32 and 38-45 are pending.

Claims 27-32 and 44-45 are withdrawn.

Claims 1-23 and 38-43 are rejected.

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 C.F.R. 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Iqbal Chowdhury, Ph.D. whose telephone number is 571-272-8137. The examiner can normally be reached on 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ponnathapu Achutamurthy can be reached on 703-272-0928. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Application/Control  
Number: 10/679,692  
Art Unit: 1652

Page 13

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Iqbal Chowdhury, PhD Patent Examiner  
Art Unit 1652 (Recombinant Enzymes)  
US Patent and Trademark Office  
Remsen Bldg., Rm. 2B69, Mail Box.  
2C70  
Ph. (571)-272-8137, Fax. (571)-273-  
8137  
IC

/Rebecca Prouty/  
Primary Examiner  
Art Unit 1652